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[Continued on next page]

(54) Title: RESERVOIR FILLING DEVICE

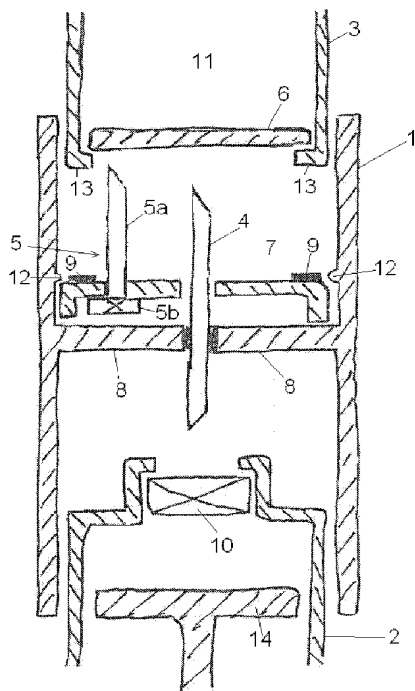


Fig. 1

(57) Abstract: The invention relates to a filling device for a reservoir which reservoir is to be filled from a cartridge such as cartridges having rigid walls e.g. made of glass and provided with a membrane which can be penetrated by a needle for protection of the entrance. According to the present invention the filling device comprises - a housing (1) which housing (1) comprises - a first position means adapted to receive a reservoir (2) for a delivering device, - a second position means adapted to receive a cartridge (3) containing a liquid, - a unit (4) providing a flow path when both the reservoir (2) and the cartridge are received respectively by the first and second positions means, - a venting unit (5, 5a, 5b) providing access of gas to the cartridge (3) during emptying of the cartridge (3). The filling device is characterized in that at least a part of the venting unit (5) is placed off the rotational centre (rc) of the housing (1) and is attached to a part (7) which part (7) can rotate relative to the housing (1).



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MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), — *with international search report (Art. 21(3))*
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Reservoir filling device

Technical field

5 The invention relates to a filling device for a reservoir which reservoir is to be filled from a cartridge such as cartridges having rigid walls e.g. made of glass and provided with a membrane which can be penetrated by a needle for protection of the entrance.

Background of the invention

10 Filling devices for reservoirs are known and it is recognized that it can be necessary to vent the container which is to be emptied for filling liquid in order to reduce the costs for filling or refilling of reservoirs.

15 A problem which arises when manufacturing such filling devices is how to place the venting channel in order not to hamper the filling process or to contaminate the filling liquid which will normally be some kind of medication.

20 US 4.296.786 discloses a transfer device for use in mixing substances in different containers which containers each are closed by a stopper of resilient material having a puncturable diaphragm. The transfer device consists of a central body portion and a pair of aligned spikes or cannulas projecting from opposite sides of this central body portion. This device is not provided with a venting needle moving independently of the filling needle, and therefore the joined spikes or cannulas according to this document have
25 a relatively large diameter.

Description of invention

30 The object of the invention is to provide a filling device which is easy to handle for the user, simple and non-expensive to manufacture and where the risk of breaking the venting needle during the filling process has been eliminated.

The invention concerns a filling device which comprising
- a housing comprising

- a first position means adapted to receive a reservoir for receiving liquid,
- a second position means adapted to receive a cartridge containing a liquid,

5 - a unit unreleasably attached to the housing and providing a flow path when both the reservoir and the cartridge are received respectively by the first and second positions means,

10 - a venting unit providing access of gas to the cartridge during emptying of the cartridge, and at least a part of the venting unit is placed off the rotational centre (r_c) of the housing and is attached to a part. The invention is characterized in that this part can rotate relative to the housing and relative to the unit providing a flow path.

15 According to one embodiment of the invention the unit providing the flow path between the reservoir and the cartridge when they are at their positions comprises a needle having two pointy ends. The needle can be made of any kind of material which can penetrate the membranes protecting the access to respectively the cartridge and the reservoir, and the needle could be blunt at one end and pointed at the other end.

20 According to one embodiment of the invention the unit providing the flow path is placed along the rotational centre of the housing.

25 According to the above embodiment of the invention the unit is fastened unreleasably to or is a part of a wall in the housing which wall separates the first position means adapted to receive the reservoir from the second position means adapted to receive the cartridge.

30 According to one embodiment of the invention the part which can rotate relative to the housing is formed as a circular plate which periphery is in proximity of or in slidable contact with walls of the housing. E.g. the circular plate can move in a track formed in the walls of the housing. The formation of a "track" prevents the circular plate from moving in a direction parallel to the rotational axis r_c of the housing. Alternatively the periphery of the

circular plate is provided with a track formed along the periphery which track corresponds to one or more protruding part(s) of the housing.

5 According to one embodiment of the invention the circular plate can be provided with a friction layer which friction layer prevents that the cartridge moves in relation to the cartridge i.e. when the cartridge is pushed into the fitted second position means of the filling device housing and the venting unit has penetrated to the inner room of the cartridge then the friction layer will reduce the risk of any displacement of the cartridge relative to the rotary
10 part.

According to one embodiment of the invention the venting unit comprises a venting needle which venting needle provides access from outside the cartridge to the inner room of the cartridge. The venting unit (5) can further
15 comprise a venting valve (5b) which venting valve (5b) provides a one-way passage of clean gas into a room wherefrom the venting needle (5a) is provided with clean gas. "Clean gas" is considered to be gas of a quality as defined as necessary by the user or by the manufacturer of the device. It can be sterile gas but might be gas of a more inferior quality. Normally the
20 gas will be atmospheric air.

According to this embodiment the venting needle is attached to the rotary part providing a flow path for clean gas from one side of the rotary part to the other and the venting valve can be attached to the open end of the
25 venting needle pointing away from the cartridge. Alternatively the venting valve can be attached to a wall of the housing providing access of clean gas from outside wall of the housing to the inside of the wall of the housing.

The invention also relates to a kit combining a cartridge filling device
30 according to any of the claims 1-11 and a cartridge containing liquid which filling device can be either for single use and thereby permanently joined to the cartridge or for multiple use and thereby can be connected and disconnected to the cartridge.

Description of the drawings

The invention is explained in greater detail below with reference to the accompanying drawings wherein two preferred embodiments of the invention are shown.

5 Fig. 1 shows a cut-through view of a filling device housing where a reservoir to be filled is half-way in position and a cartridge containing liquid is also half-way in position;

 Fig. 2 shows a cut-through view of a filling device housing where the venting valve is placed away from the venting needle.

10

The embodiment of the reservoir filling device of fig. 1 is shown in a state where liquid cannot be transferred from the liquid containing cartridge 3 to the reservoir. The embodiment of the filling device comprises a housing 1 having cylindrical outer walls and a separating wall 8 dividing the housing
15 into two positions, a first position for the reservoir 2 to be filled and a second position for the cartridge 3 to be emptied. Each position is either provided by the walls of the housing 1 thereby providing a close fit for the device to be placed there or is provided with guiding means assuring a well-defined final position of the device to be placed. In the most simple form both or one of
20 the positions only comprise a central portion in form of the separating wall 8 having no outer walls. The positions including the guiding means are referred to as position means.

The embodiment of the filling device further comprises a filling needle 4
25 which filling needle 4 provides a flow path for liquid flowing from the cartridge 3 to the reservoir 2. Both the cartridge 3 and the reservoir are in the embodiments of fig. 1 each provided with a membrane 6 and 10 which have to be penetrated by the filling needle 4 in order to create a flow path between the two units. The filling needle 4 is unreleasably attached to the
30 separating walls 8 and kept in a stationary position relative to the housing 1 along the central axis of the housing 1.

The filling device is also provided with a rotary part 7 which according to this embodiment is formed as a turntable provided with a folding at the

periphery. The folding provides a contact surface which can slide along the inner surface of the housing 1 wall. The rotary part 7 can rotate around the filling needle 4 which according to this embodiment is stationary relative to the housing 1.

5

The rotary part 7 is prevented from moving in the longitudinal direction by one or more protruding parts 12 preventing the rotary part 7 from moving towards the cartridge and the separating wall 8 preventing the rotary part 7 from moving towards the reservoir 2.

10

Gas can pass from one side of the rotary part to the other through the venting needle 5 which according to this embodiment is constructed of a penetrating member 5a and a valve member 5b which two parts are joined. The penetrating member 5a is unreleasably attached to the rotary part 7 and provides a flow path for gas through the rotary part 7 and into the clean inner room 11 of the cartridge 3. The penetrating member 5a will normally be provided with a pointed end towards the cartridge in order for it to be able to cut through the membrane layer 6 protecting the entrance of the cartridge 3.

20

The venting valve 5b is attached to the open end of the penetrating member 5a turned towards the reservoir 2 and the valve 5b allows for gas/air to pass from the room between the rotary part 7 and the separating wall 8 into the inner room 11 of the cartridge 3 when the penetrating member 5a has penetrated the membrane 6 and been inserted into this room. The valve 5b prevents micro organisms from accessing the clean inner room 11 of the cartridge 3.

25

The rotary part 7 is according to this embodiment provided with one or more friction layers 9 on the side turned toward the cartridge 3. The friction layers 9 correspond to contact surfaces 13 on the cartridge 3 and when the friction layers 9 and the contact surfaces make contact the two units are "locked" relative to each other and move together.

30

Fig. 1 also shows the reservoir 2 when this is pushed half-way into the position of the housing 1, in this half-way position the filling needle 4 does not penetrate the septum or membrane 10 which is protecting the entrance of the reservoir 2. The reservoir 2 according to this embodiment is also
5 provided with an illustrative piston with which liquid has been pushed out of the reservoir 2 during use and emptying of the reservoir 2. When filling the reservoir with liquid from the cartridge 3 the piston 14 is pulled back causing a reduced pressure in the reservoir 2 and this reduced pressure will
10 transport liquid contained in the cartridge via the flow path provided by the filling needle 4 into the reservoir 2. The removal of liquid from the cartridge 2, which is a closed container with rigid walls, will reduce the pressure in the cartridge 3 and if air or other gas is not let into the inner room of the
15 cartridge 3 then it will be necessary to assure that the piston 14 seal tightly toward the inner walls of the reservoir 2 in order to be able to provide a reduced pressure which can overcome the low pressure in the cartridge 3.

Instead of increasing the quality of the reservoir piston 2 it can be more convenient to prevent the pressure inside the cartridge 3 to drop to low and this can be done e.g. as suggested according to the present embodiment of
20 the filling device by letting air or other gas into the cartridge through the venting needle 5.

Fig. 2 shows another embodiment of a filling device according to the present invention. According to this embodiment the penetrating member 5a and the
25 venting valve 5b are separated from each other. The venting valve 5a transfers gas or air from the outside of the housing 1 into the clean room 11 between the rotary part 7 and the separating wall 8. According to this embodiment the rotary part 7 must provide an airtight seal against the walls of the housing 1. The penetrating member 5a has a blunt end turned toward
30 the reservoir 2 and a pointed end turned toward the membrane of the cartridge 3. When the cartridge 3 is pushed into position the penetrating member 5a will penetrate the membrane 6 and provide a flow path for clean gas/air between the clean room 11 formed between the rotary part 7 and the separating wall 8 and the inner clean room 11 of the cartridge 3. Gas will

flow through this flow path when the pressure is reduced in the reservoir 2 as the piston 14 is pulled back.

5 As in the embodiment of fig. 1 the filling needle 4 is provided with two pointed ends respectively penetrating the membrane 6 of the cartridge 3 and the membrane 10 of the reservoir 2 when these two devices are pushed into each their position.

10 The housing 1 of the filling device according to the present invention need not be cylindrical or have a round profile but it should be able to provide a close fit between the rotary part 7 and the inner surface of the housing 1 especially according to the embodiment of fig. 2 where it is necessary to have clean atmosphere in the room between the rotary part 7 and the separating walls 8. If the inner surface of the housing at this position is not
15 round it could be provided with a round track e.g. formed in a protruding part of the inner surface of the walls of the housing 1.

The liquid contained in the cartridge will often be a kind of medication which advantageously can be continuously administrated to a patient. This
20 medication could e.g. be insulin which can be continuously administered to patients with diabetes. In this case the cartridge 3 could be a glass ampoule containing an apportioned amount of insulin.

25

Claims

1. Filling device comprising
 - a housing (1) comprising
 - first position means adapted to receive a reservoir (2) for receiving
 - 5 liquid,
 - second position means adapted to receive a cartridge (3) containing a liquid,
 - a unit (4) unreleasably attached to the housing (1) and providing a flow path when both the reservoir (2) and the cartridge are received respectively
 - 10 by the first and second positions means,
 - a venting unit (5, 5a, 5b) providing access of gas to the cartridge (3) during emptying of the cartridge (3), and at least a part of the venting unit (5) is placed off the rotational centre (r_c) of the housing and is attached to a part (7) **characterized in** that this part (7) can rotate relative to the housing (1)
 - 15 and relative to the unit (4) providing a flow path.
2. Filling device according to claim 1, wherein the unit (4) providing the flow path between the reservoir (2) and the cartridge, when the cartridge is placed according to the second position means, comprises a needle having
- 20 two pointy ends.
3. Filling device according to claim 1 or 2, wherein the unit (4) providing the flow path is placed along the rotational centre of the housing (1).
- 25 4. Filling device according to claim 3, wherein the unit (4) is fastened unreleasably to or is a part of a wall (7) in the housing (1) which wall (7) separates the first position means adapted to receive the reservoir (2) from the second position means adapted to receive the cartridge (3).
- 30 5. Filling device according to any preceding claim, wherein the part (7) which can rotate relative to the housing (1) is formed as a circular plate which periphery is in proximity of or in slidable contact with walls of the housing (1).

6. Filling device according to claim 5, wherein the circular plate moves in a track formed in the walls of the housing (1).

5 7. Filling device according to claim 5, wherein the periphery of the circular plate (7) is provided with a track formed along the periphery which track corresponds to one or more protruding part(s) of the housing (1).

10 8. Filling device according to any of the claims 5-7, wherein the circular plate (7) is provided with a friction layer (9) which friction layer (9) prevents the cartridge (3) from moving relative to the circular plate (7).

15 9. Filling device according to any preceding claim, wherein the venting unit (5) comprises a venting needle (5a) providing access from outside the cartridge (3) to the inner room of the cartridge (3) during use.

10. Filling device according claim 9, wherein the venting unit (5) comprises a venting valve (5b) providing a one-way passage of clean gas into a room wherefrom the venting needle (5a) is provided with clean gas.

20 11. Filling device according to claim 10, wherein the venting needle (5a) is attached to the rotary part (7) providing a flow path for clean gas from one side of the rotary part to the other and the venting valve (5b) is attached to the open end of the venting needle (5a) pointing away from the cartridge (3).

25 12. Filling device according to claim 10, wherein venting needle (5a) is attached to the rotary part (7) providing a flow path for clean gas from one side of the rotary part to the other and the venting valve (5b) is attached to a wall of the housing (1) proving access of clean gas from outside wall of the housing to the inside of the wall of the housing (1).

30 13. Kit combining a filling device according to any of the claims 1-11 and a cartridge (3) containing liquid which filling device can be either for single use and thereby permanently joined to the cartridge (3) or for multiple use and thereby can be connected and disconnected to the cartridge (3).

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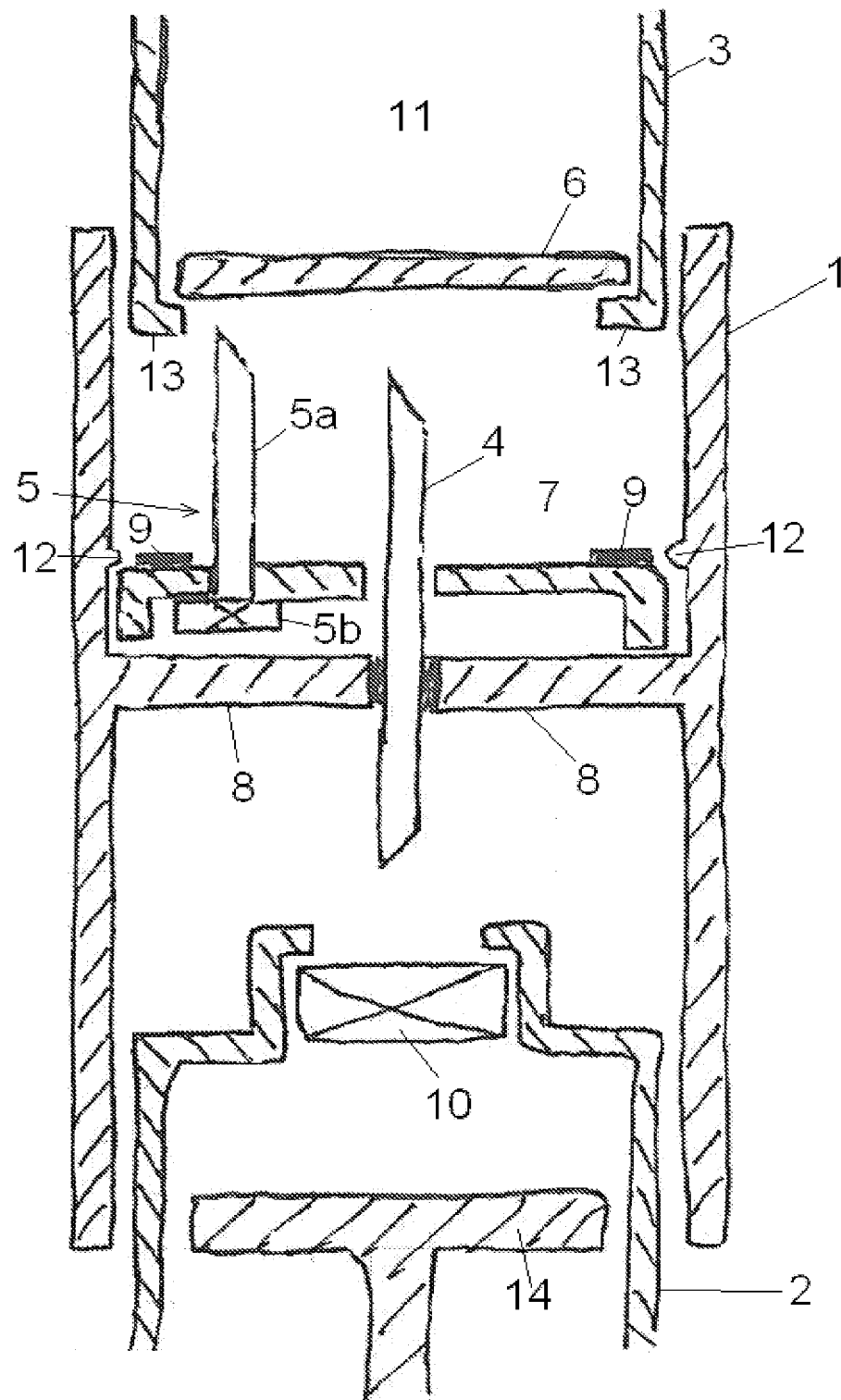


Fig. 1

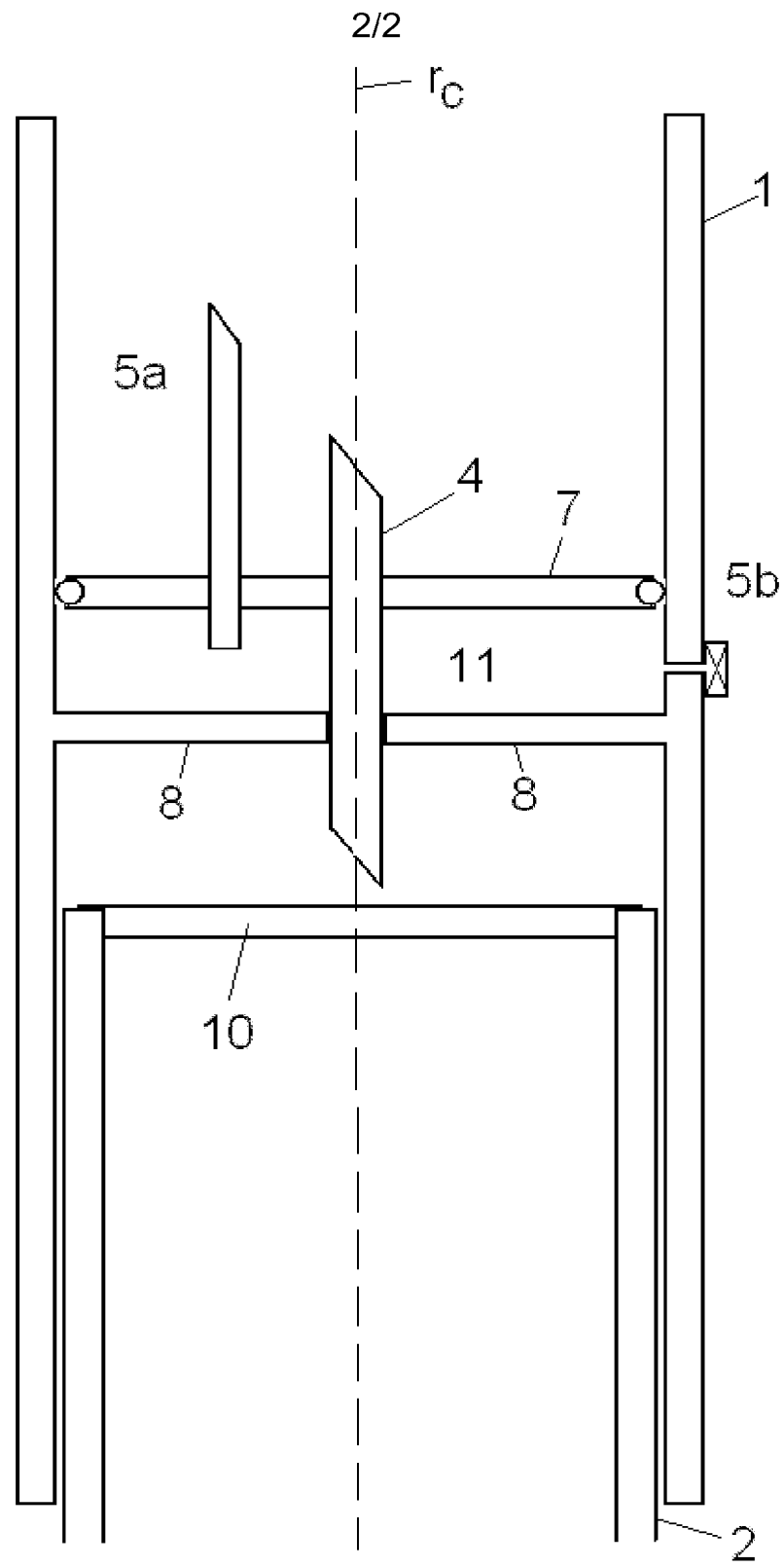


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/056533

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61J1/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 783 895 A (WEICHSELBAUM T) 8 January 1974 (1974-01-08) column 2, line 36 - column 4, line 25; figures 4,5	1,3,4,9, 10,13
X	WO 93/11709 A (HABLEY MEDICAL TECHNOLOGY CORP [US]); 24 June 1993 (1993-06-24) page 10, line 7 - page 12, line 6; figures 11-14	1,4-6,9, 10,13
X	WO 2008/048631 A (CARDINAL HEALTH 303 INC [US]; YOW GREGORY D [US]) 24 April 2008 (2008-04-24) page 7, lines 18-26 page 8, line 21 - page 9, line 17; figures 3,4	1,3,4,9, 13

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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 139 534 A (NIEDOSPIAL JR JOHN J [US] ET AL) 31 October 2000 (2000-10-31) column 3, line 35 - column 4, line 2; figures 3,5A -----	1,3,9
A	US 4 296 786 A (BRIGNOLA DOMINIC J) 27 October 1981 (1981-10-27) column 8, line 46 - column 9, line 7; figure 14 -----	1-6,9,13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2009/056533

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